

What is claimed is:

1. An apparatus for driving a liquid crystal display, the apparatus comprising:
a signal controller for generating digital signals for different pixel colors;
a gray voltage generator coupled to the signal controller, wherein the gray voltage
5 generator generates gray voltage signals that are specific to the different pixel colors; and
a data driver coupled to the gray voltage generator and the signal controller, wherein
the data driver converts each one of the digital signals to a corresponding analog signal by
selecting one of the gray voltage signals that is associated with the same pixel color as the
digital signal that is being converted.
- 10 2. The apparatus of claim 1, wherein the gray voltage generator separately
stores gray voltages for each of the pixel colors and for each voltage polarity.
3. The apparatus of claim 1, wherein the gray voltage generator comprises:
a first color-specific gamma voltage register; and
a second color-specific gamma voltage register coupled to the first gamma voltage
15 register wherein the first and second color-specific gamma voltage registers store digital
gamma voltages received from the signal controller, for a specific pixel color.
4. The apparatus of claim 3, wherein the gray voltage generator further
comprises a digital-to-analog converter for converting the digital gamma voltages that are
stored in the first and the color-specific second gamma voltage registers into analog gray
20 voltages.
5. The apparatus of claim 4, wherein the first color-specific gamma voltage
register and the second color-specific gamma voltage register are connected by a first set of
ten-bit buses, and at least one of the first and second color-specific gamma voltage registers is
connected to the digital-to-analog converter by a second set of ten-bit buses.
- 25 6. The apparatus of claim 4, wherein the data driver comprises a plurality of

data driving circuits for receiving image data and data control signals from the signal controller, wherein each of the data driving circuits includes a sampling unit for sampling gamma voltage data from the digital-to-analog converter.

7. The apparatus of claim 6, wherein the sampling unit comprises a plurality of
5 sampling circuits, each of which includes:

a switch that turns on in response to a sampling signal from the signal controller;
a capacitor coupled to the switch for storing the sampled gamma voltage data; and
an analog buffer coupled to the capacitor for outputting the stored gamma voltage
data.

10 8. The apparatus of claim 6, wherein the image data are transmitted from the
signal controller to the data driving circuits by two signal lines that are separately connected
between the data driving circuits and the signal controller.

9. The apparatus of claim 1, wherein the gray voltage generator is coupled to
the data driver by a plurality of buses.

15 10. The apparatus of claim 1, wherein the signal controller comprises a register
for storing a predetermined number of digital gamma data, wherein the digital gamma data
are supplied to the gray voltage generator for generating independent gamma curves for the
different pixel colors.

11. The apparatus of claim 1 further comprising a gate driver coupled to the
20 signal controller, wherein the gate driver generates gate control signals in response to signals
from the signal controller.

12. A liquid crystal panel assembly comprising:
a plurality of pixel electrodes, wherein each of the pixel electrodes is associated with
a pixel color;

a common electrode positioned substantially parallel to the pixel electrodes;
a liquid crystal layer positioned between the pixel electrodes and the common electrode;

a data driver for supplying data signals to the pixel electrodes; and
5 a gray voltage generator coupled to the pixel electrodes, wherein the gray voltage generator generates gray voltages that are each associated with a pixel color, so that the data driver determines a particular data signal for a particular pixel electrode by using one of the gray voltages that is associated with the pixel color of the particular pixel electrode.

13. The panel assembly of claim 12, wherein the gray voltage generator
10 separately stores gray voltages for each pixel color and voltage polarity.

14. The panel assembly of claim 12, wherein the gray voltage generator comprises:

a first gamma voltage register; and
a second gamma voltage register coupled to the first gamma voltage register, wherein
15 the first and second gamma voltage registers store gray voltages for each pixel color separately.

15. The panel assembly of claim 14, wherein the gray voltage generator further comprises a digital-to-analog converter for converting the digital data stored in the first and the second gamma voltage registers into analog gray voltages.

20 16. The panel assembly of claim 15, wherein the first gamma voltage register and the second gamma voltage register are connected by a first set of ten-bit buses, and at least one of the first and second gamma voltage registers is connected to the digital-to-analog converter by a second set of ten-bit buses.

17. The panel assembly of claim 15 further comprising a signal controller

coupled to the data driver, wherein the data driver comprises a plurality of data driving circuits for receiving image data and data control signals from the signal controller, wherein each of the data driving circuits includes a sampling unit for sampling gamma voltage data from the digital-to-analog converter.

5 18. The panel assembly of claim 17, wherein the sampling unit comprises a plurality of sampling circuits, each of the sampling circuits including:

 a switch for controlling the sampling of the gamma voltage data;

 a capacitor coupled to the switch for storing the sampled gamma voltage data; and

 an analog buffer coupled to the capacitor for outputting the stored gamma voltage

10 data.

 19. The panel assembly of claim 17, wherein the image data are transmitted from the signal controller to the data driving circuits by two signal lines that are separately connected between the data driving circuits and the signal controller.

 20. The panel assembly of claim 17, wherein the signal controller comprises a

15 register for storing a predetermined number of digital gamma data, wherein the digital gamma data are supplied to the gray voltage generator for generating independent gamma curves for different pixel colors.

 21. The panel assembly of claim 12, wherein the gray voltage generator is coupled to the data driver by a plurality of buses.

20 22. A method of driving a liquid crystal display, the method comprising:

 generating gray voltages for different pixel colors;

 receiving digital data for pixels having different pixel colors;

 converting the digital data to a corresponding analog data by using one of the gray voltages that is associated with a same pixel color as the digital data being converted.

23. The method of claim 22 further comprising storing the gray voltages separately according to pixel colors.

24. The method of claim 22 further comprising generating independent gamma curves for different pixel colors, wherein gamma curves are used for converting the digital
5 data to the corresponding analog data.